



WYOMING Native Seed Survey Report

Executive Summary

The Nature Conservancy (TNC) set out to better understand native seed availability, demand, and associated policies, by engaging key stakeholders involved in restoration and rehabilitation efforts in Wyoming. Understanding the current native seed market and communicating with stakeholders is a necessary first step toward addressing the needs of restoration, reclamation and rehabilitation efforts across the state.

To do this, we launched a 16-question Wyoming Native Seed Survey in March 2022, using Survey Monkey. The survey was shared with 112 individuals across both government and private industry, with a goal of reaching the maximum number of seed users in the state. To get the perspective of seed end-users, we excluded seed producers from our survey. We received a total of 60 responses, and the answers to each question are summarized in this report. The respondents covered most of Wyoming's major sectors and represented restoration work being done across the state.

According to survey results, restoration practitioners in Wyoming spend approximately \$3.9 million on reseeded efforts annually and native seeds make up the majority of seed purchased. While most respondents indicated that their organizations have a policy regarding the use of native plant seed, few organizations had rules or guidelines dictating that the native plant seed had to be "local" or have originated within a certain distance of the project site. Procuring "local" seed can be challenging because most of the major seed distributors obtain seed from across the western US or sell cultivars of native seed.

Overall, respondents indicated that they would like to see an increase in the availability of native forbs (wildflowers); almost half of the desired species listed by respondents were forbs. Foundational shrubs of Wyoming like sagebrush (*Artemisia spp.*) and winterfat (*Krascheninnikovia lanata*) were also frequently listed as desired but difficult to obtain. The two main barriers to using an ideal native



seed mix were identified as the lack of availability of native seeds and the cost of native seeds.

Based on this survey, we would expect that Wyoming's native seed market is less volatile than in other western states where most funds spent on seed go toward wildfire rehabilitation (which makes demand difficult to predict from year to year). Most of the spending on native seed in Wyoming goes toward planned projects (e.g., habitat improvement and engineering or construction projects), although most often seed purchasing itself is not done in advance, but instead, as needed. Encouraging seed purchasers to pre-emptively plan for their seed needs is an opportunity to stabilize the Wyoming seed demand and could facilitate the production and availability of desired native plant seeds.



Background Information

Successful restoration of plant communities depends on the availability of seed for a broad range of plant species. This is because different plants serve different roles and functions, and when plant species diversity declines, so does the health and function of that ecosystem, which is bad for wildlife and people alike.

Seeding efforts can range from using non-native species, like crested wheatgrass, to using only seed collected from nearby native plant populations — and many variations in between. The seeding strategy that is chosen is often dependent on the goals of the project. While some projects may rely on non-native species to quickly revegetate and stabilize a site, many restoration projects attempt to restore the pre-existing native plant community. By restoring native plant species to a site, the project can support local wildlife and ensure that the area is serving the same function in the ecosystem as it did pre-disturbance.

The success of projects attempting to restore native plant communities often depend on the origins of the seed being used. This is because different populations of native plants are genetically different from one another and can be adapted to the climatic conditions of the areas in which they are found (locally adapted). When planted outside of these areas in which they evolved, plants have a higher chance of dying, and this can lead to restoration failure.

Unfortunately, the supply of locally adapted native seed is limited throughout Wyoming; this is diminishing restoration and rehabilitation success and contributing to the loss of the state's unique and diverse native plant communities. With long-term drought, warming, the spread of invasive annual grasses and the associated wildfires, seeding needs in the state are likely to expand in the coming years. This makes the issue of native seed supply increasingly important as the acres in need of restoration grow. To use locally adapted seed, one needs to know where the seed was collected (seed origin) and to make sure that it is being seeded in a location that is matched to the climatic conditions of the seed origin.



This is typically done using seed zones or seed transfer guidelines, which delineate areas that are climatically similar, to increase the likelihood that seeds sown at these sites are adapted to the conditions they will encounter.

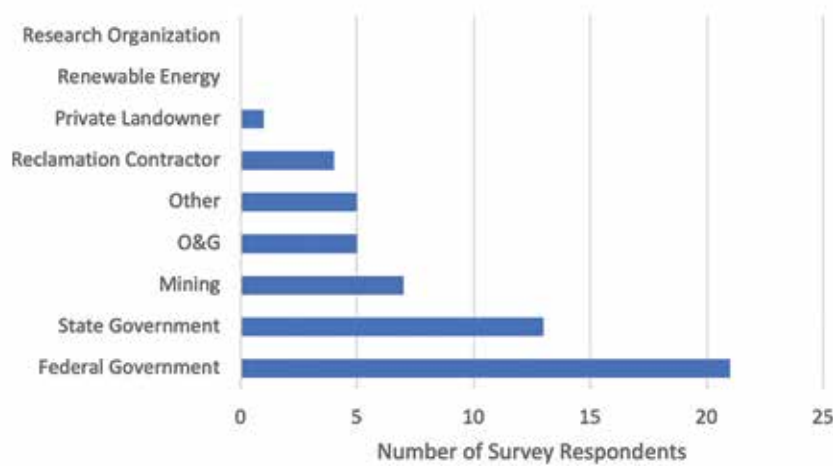
Understanding the availability, demand, and the policies and practices that guide the use of native seed in Wyoming is an important first step toward improving seed availability to meet the needs of key stakeholders in the restoration, reclamation, and rehabilitation sectors working throughout the state.

Survey Responses

Question 1:

What sector do you work in?

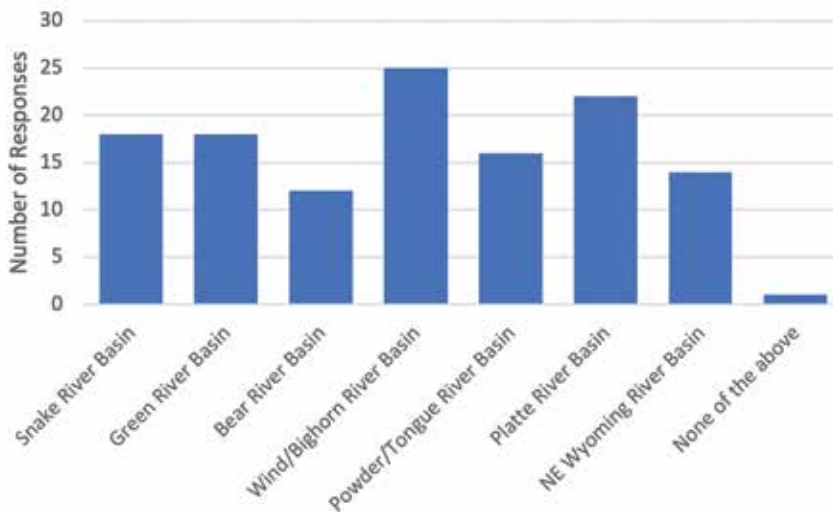
Most respondents were federal and state government employees, but we also captured responses from the main industries in Wyoming including mining and oil and gas (O&G). Although there were no respondents employed by renewable energy companies, a least one consultant that filled out the survey works with the renewable energy industry.



Question 2:

What part of Wyoming do you work in?

For this question, respondents were encouraged to check all that applied and were directed to the map of Wyoming in the Wyoming State Water Plan. The survey respondents represented a broad geographic spread across the state with each basin represented by at least 10 respondents.

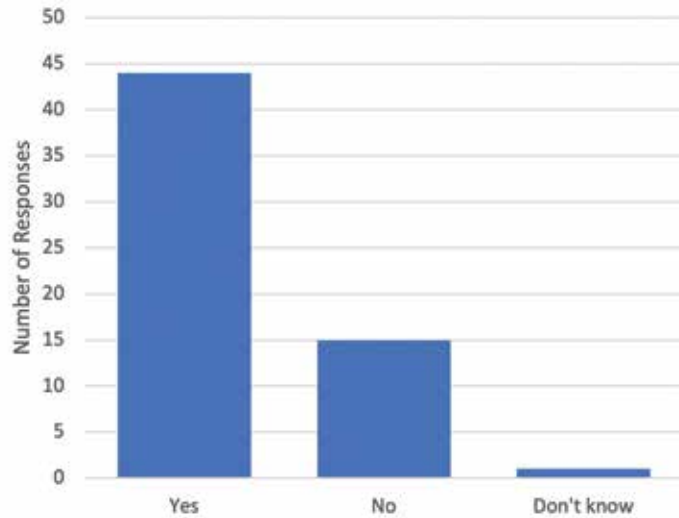




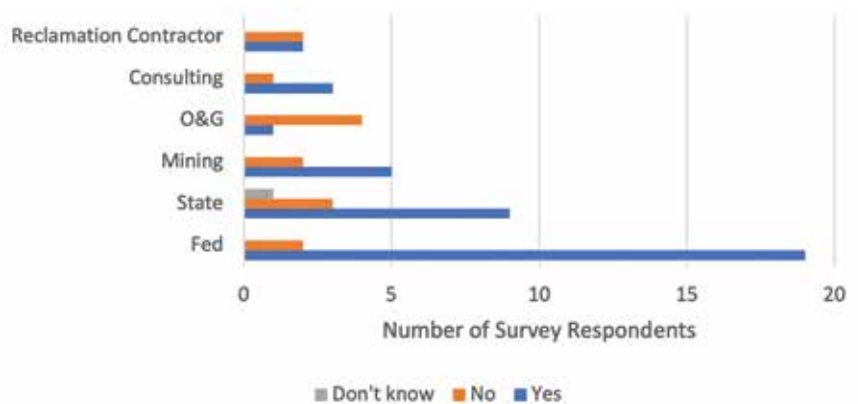
Question 3:

Does your organization have a policy for the use of native versus non-native plant seed in revegetation or restoration?

Overall, 73% of respondents (44 people) said that their organization had a policy for the use of native over non-native plant seed during revegetation.



Ninety percent of federal government respondents indicated they had a policy for use of native over non-native seed, 70-75% of state government respondents similarly indicated that such a policy existed. The remaining respondents that stated they had a policy about the use of native seeds were from the mining or consulting sectors. Conversely, 80% of O&G respondents said they had no such policy. Much of O&G reseeded happens on private land where the seed mix is at least partially determined by the private landowner, who may be prioritizing forage quality over ecological restoration.

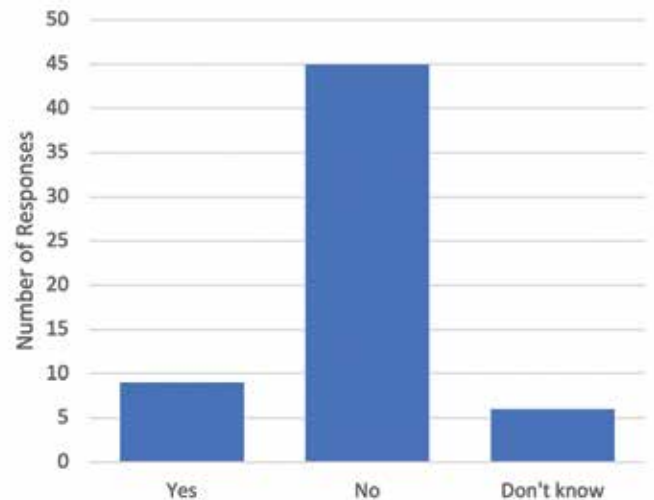




Question 4:

Does your organization have a specific policy about sourcing seed within a certain distance of the revegetation project site?

Most (75%) of the respondents did not have a policy associated with sourcing seeds within a certain distance of a project site and a small proportion of respondents (10%) were not aware of this type of policy. Only 15% of respondents indicated that their organization had guidance around seed sourcing distance. These organizations were spread across many different sectors: federal government (3), state government (1), mining (3), private landowner (1) and other (1-field school).



Question 5:

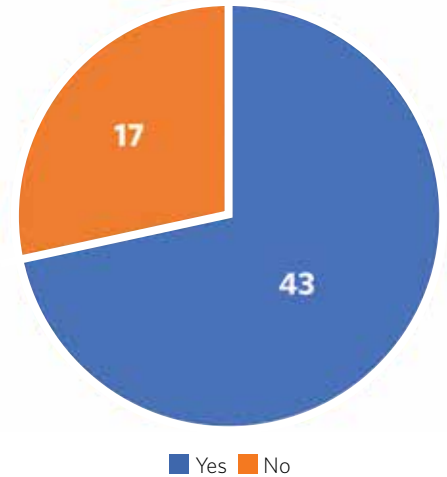
If yes to Q4, what is that distance?

The distances provided by respondents varied widely and included 30 miles (or equal elevation), 50-100 miles, 250 miles, within national park boundaries, within the state of Wyoming, and as close as possible. One respondent indicated that while their organization did not have a specific distance requirement for seed sourcing, they regularly worked with seed companies to identify seed lots that would fit their project sites.

Question 6:

Do you request information about seed origins (geographic location of the original seed source) before seeding? Seed origins may be important if you want to source seeds from the same seed zone or ecoregion as the restoration site or if you want to increase resilience to future climate conditions.

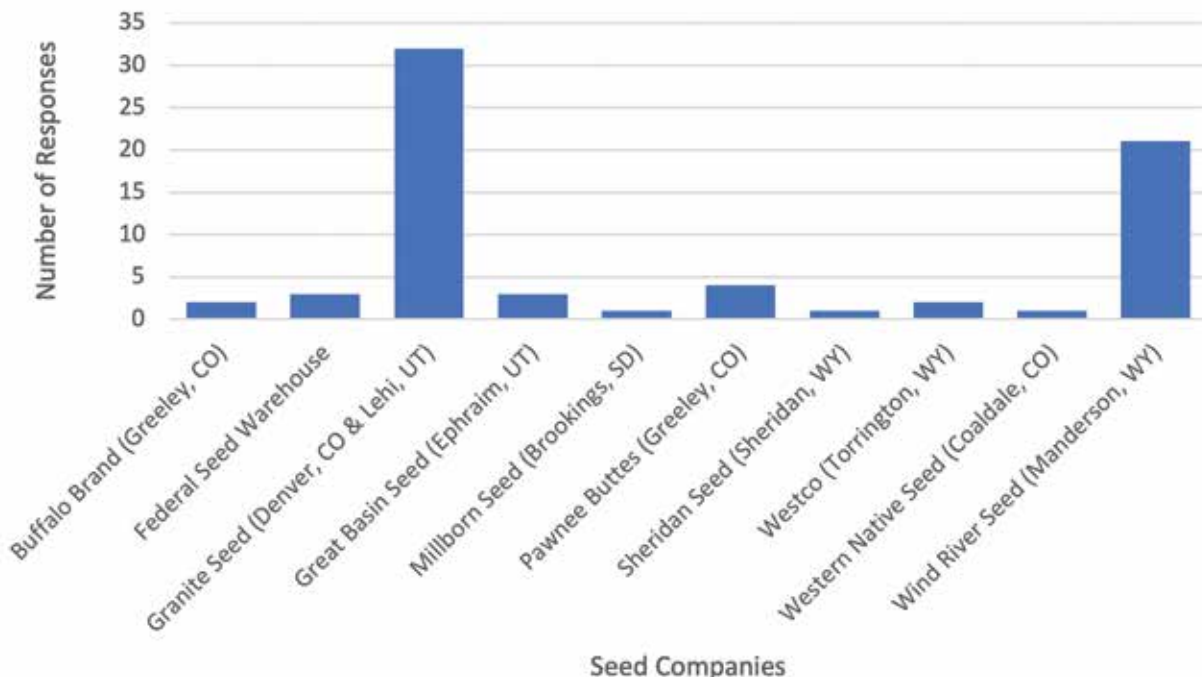
Most respondents (72%) said that they request information on seed origins when purchasing seed. While most native seed used in restoration in WY is of known sources, a significant portion is coming from sources that are unknown or not considered in seed source selection.



Question 7:

Where does your organization obtain seed for restoration projects?

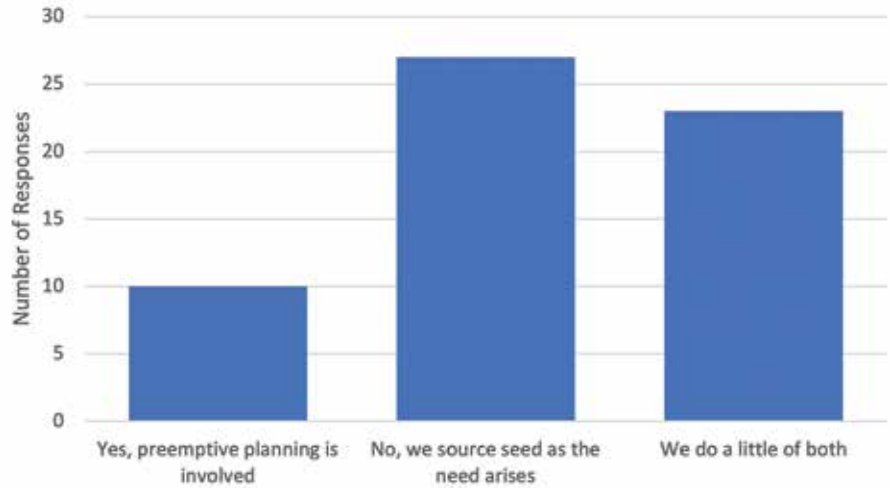
Respondents were encouraged to list all places from which they sourced seed. Ten seed companies were listed as providing seed for restoration. Most respondents (68%) reported sourcing seed from Granite Seed or Wind River Seed, the largest seed suppliers in the region. These are the largest seed suppliers for the region. Of these two major suppliers, only Wind River Seed is located within Wyoming, but Granite Seed does obtain seed from seed producers in Wyoming (although they are physically located in Colorado and Utah). Five federal government employees also indicated that they sourced seed from BLM seed warehouses.



Question 8:

Does your organization preemptively plan for seed needs (at least a year in advance) or does it procure seed on an “as needed” basis?

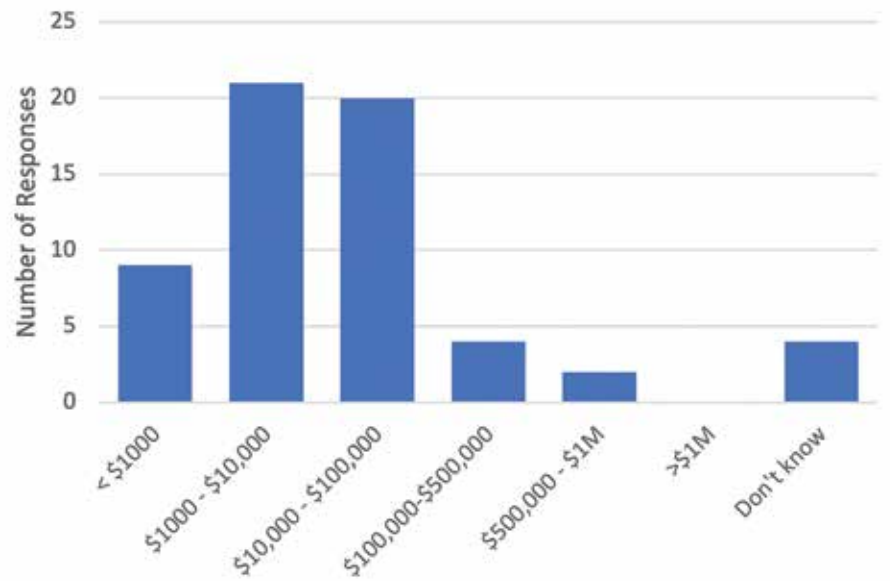
Few (17%) respondents that participated in the survey indicated that they preemptively plan for all their seed purchases exclusively; many organizations either buy seeds as they are needed or do a little of both.



Question 9:

On average, how much do you or your organization/department/field office spend on seed purchases annually?

Most respondents and their associated organizations spend between \$1,000 and \$100,000 annually on seed purchases. The midpoint of each range was used to calculate the average spent annually on seed in Wyoming. According to this survey, at least \$3.9 million is spent on seed for revegetation each year. We believe this is a conservative estimate given that we were not able to get responses from all seed purchasers in the state.



SECTOR	AVERAGE AMOUNT SPENT ANNUALLY ON SEED
Mining	\$1,120,000
Federal government	\$978,000*
Reclamation contractor	\$865,500
State government	\$543,000
O&g	\$275,000
Consulting	\$66,000

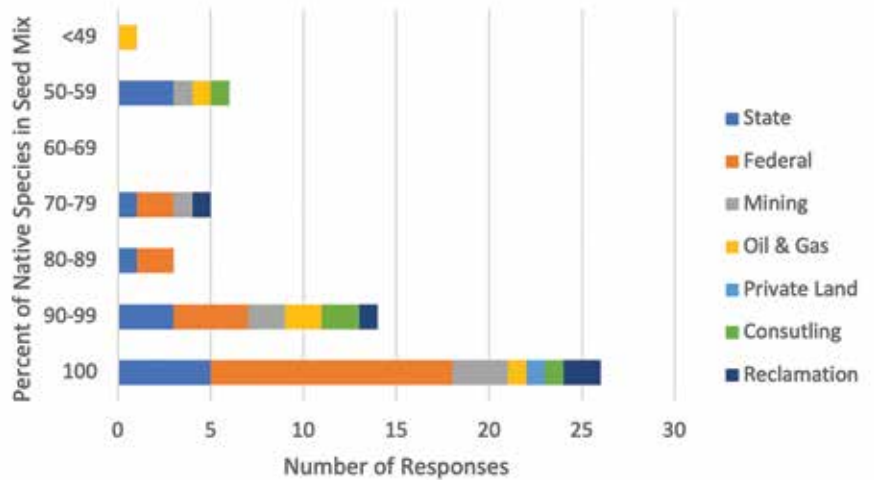
* Agency reporting highest spending also has projects outside of WY



Question 10:

What percent of your typical reseeding mix is composed of native species (by species number)?

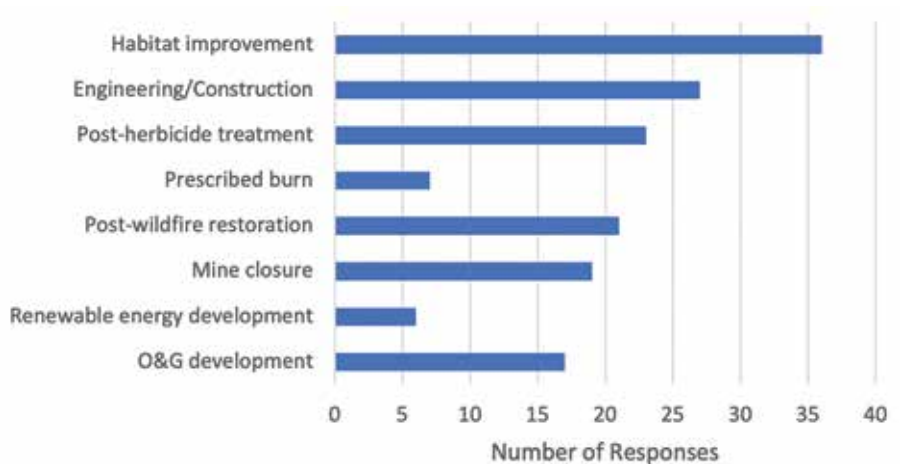
Most respondents (71%) said that 90-100% of their seed mixes were composed of native species. Federal agencies reported the highest proportion of their seed mixes are made up of native species. Those respondents with less than 60% of their seed mixes made of up native species were from state government, mining, oil and gas, and consulting sectors. There are likely a variety of reasons that non-native species are used in seed mixes including landowner preferences, restoration goals, and seed availability.



Question 11:

What types of restoration/reclamation projects do you use direct seeding for?

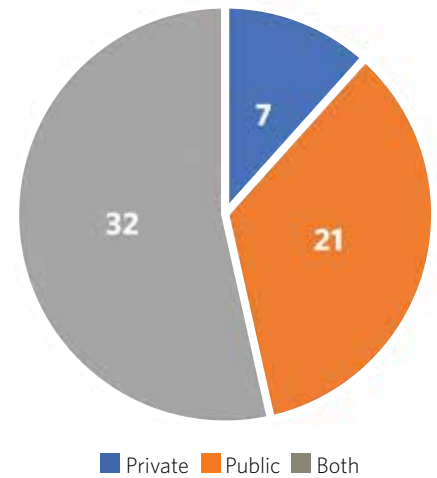
For this question the respondents were encouraged to check all that applied. The responses to this question indicate that there is not a single type of project that dominates seed purchasing in the state.



Question 12:

Do your projects occur on public or private land?

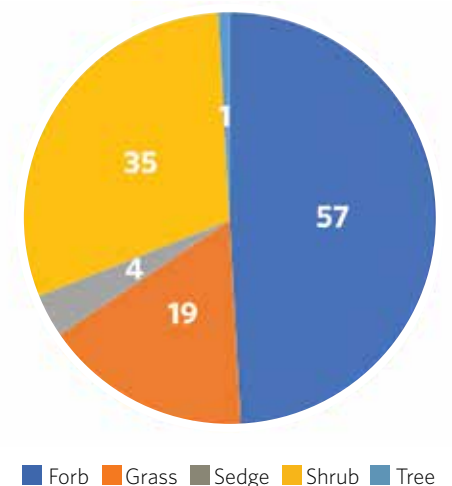
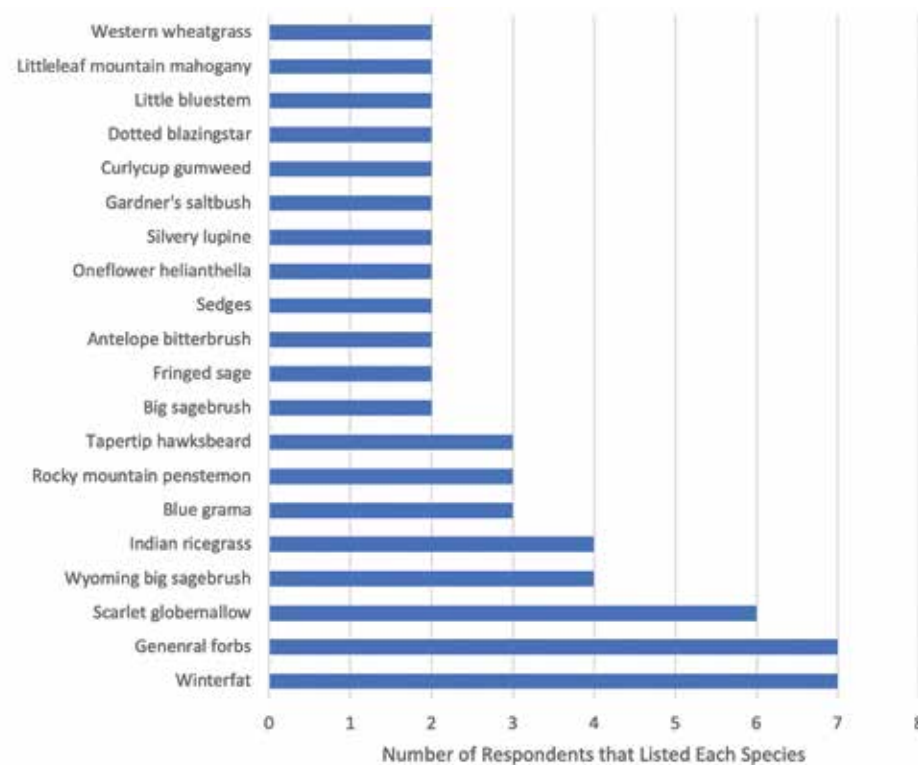
Most respondents (53%) work on both public and private land, with the next largest share reporting only working on public land (35%) which makes up roughly half of Wyoming's land base. Only 12% reported working only on private lands.



Question 13:

Please list up to 5 native species you or your organization would like to use in restoration but cannot for some reason.

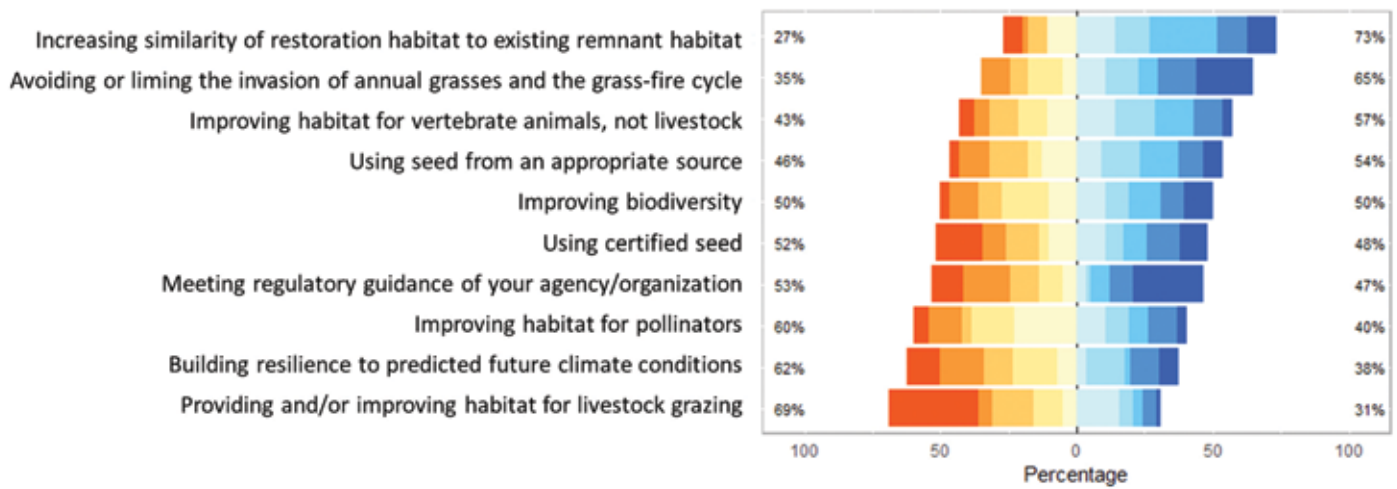
The chart below shows species that were listed by 2 or more respondents. There were another 56 species that were only listed by one respondent. The top responses were winterfat (*Krascheninnikovia lanata*), an important shrub species that provides forage for wild and domestic animals, as well as a general request for greater forb availability. The lack of forb seed availability in Wyoming is also reflected in the second figure which shows number of species requested that falls into each functional group. Almost 50% of the species listed by respondents, when categorized by functional group, were forbs. The second most requested (30%) functional group was shrubs. A full list of species is in Attachment 1.



Question 14:

Please rank how important the following goals/considerations are to you and your organization when designing seed mixes and purchasing seeds (1 most important, 10 least important).

The graph below shows the overall importance of each of the ten listed considerations in designing seed mixes and purchasing seed across all respondents. The considerations are ranked in the order of importance, with the lower ranking (shown in shades of blue) indicating higher importance. This is shown on the graph by a shift to the right or toward the deepest shade of blue. If a consideration was deemed less important, that is represented by a shift to the left, towards the deepest shade of orange. Overall, the establishment of similar vegetation to existing remnant habitat was one of the most important considerations reported by survey respondents.



Question 15:

What do you see as the main barrier to achieving a more ideal native seed mix for your restoration projects?

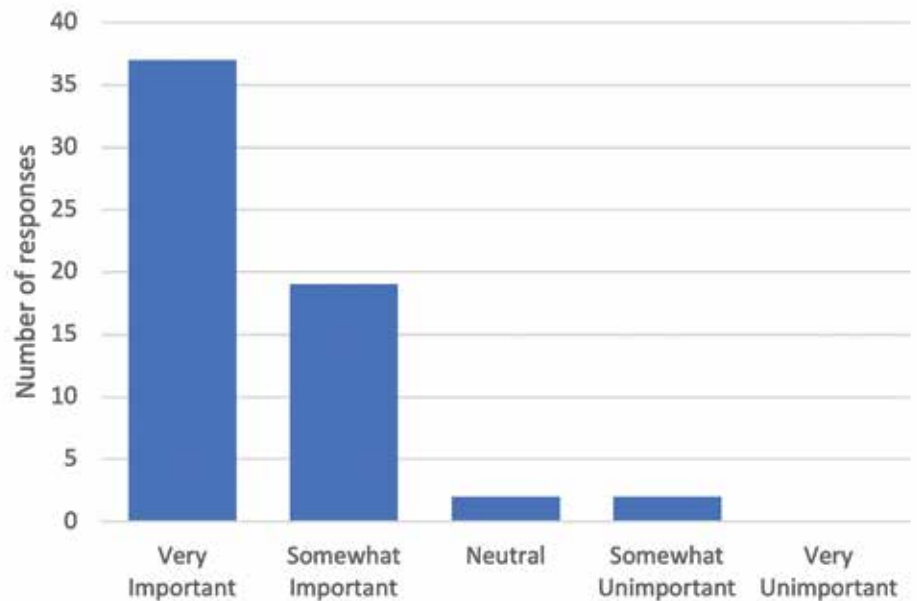
For this question respondents were encouraged to check all that applied. If respondents listed lack of local or genetically appropriate seed in the comments when they selected “Other,” we included those responses in the “Lack of availability of native seed” category. Overall, the lack of availability (37%) and cost of native seed (30%) were the most frequently selected barriers to creating an ideal seed mix, confirming what we have heard from stakeholders. Interestingly, lack of expertise and capacity to spend time designing seed mixes were also reported as barriers by 22 (36%) of the respondents.



Question 16:

How important are success rates from previous reseeding projects (e.g., evidence of success or failure) in influencing your seed mix design?

Most (93%) respondents consider previous reseeding outcomes when designing seed mixes. This indicates a desire to learn from and improve future restoration outcomes. However, if there is a strong inclination to continue to seed species that have worked in the past, it may be difficult to convince seed users to include new species without a track record of success.



Conclusions & Recommendations

The results of this survey have clarified a few opportunities which could improve the availability of native seeds in Wyoming.

While the year-to-year fluctuation in the native seed supply and demand is a pervasive issue that impacts the native seed market, there are a variety of restoration project types (e.g., O&G development, mine closure, engineering and construction) that are being planned in advance as opposed to in response to an unforeseen event, like wildfire. This suggests that seed demand in Wyoming could be less volatile than in states where the majority of seeding projects are done following wildfire. However, survey respondents indicated that advanced planning for seed needs is not currently done for the majority of the planned projects. This presents an opportunity for seed users to improve advanced seed planning to facilitate contracted pre-orders and/or more consistent ordering practices, which could encourage producers to expand their offerings by reducing their financial risk.

Communication and collaboration between seed users and seed producers could positively impact the native seed market by establishing a feedback loop between growers and seed users, allowing two-way communication about the challenges and successes associated with both the production of different species and seedlots for restoration and the outcomes of restoration efforts that use this seed. These communication feedback loops can result in improved planning and seed mix design, as well as build a stronger native seed industry in the state. Additionally, while the majority of organizations conducting seeding in Wyoming reported having a policy for the use of native over non-native plant seed, there may be some opportunities to improve the availability of native seeds by proactively working to educate landowners on the



importance of native plant species. For example, most O&G respondents, who perform a lot of restoration work on private land, indicated that they had no policy regarding seeding native versus non-native species. In conversations about the survey with O&G reclamation practitioners, TNC was informed that typically on private land the seed mix used to reclaim O&G development is dictated by landowner requests. Through education, we may be able to shift some of the seed market toward native plant species. By increasing the market for standard native restoration species, producers may have more flexibility to expand into new and desired native species.



Most of the respondents reported that their organization did not have a policy associated with sourcing seeds within a certain distance of a project site and more than a quarter of the respondents did not request seed origin information when purchasing seeds. While sourcing seed from a specific distance from restoration site was mentioned by a few respondents, it was not clear to what extent seed zones or seed transfer guidelines (which reflect similarity in climatic conditions instead of simply geographical distance) are being used in seed sourcing decisions. When there is a mismatch between the seed origin and project site, the likelihood of seeding failure increases^{1,2}. The lack of availability and cost of native locally adapted seed were the most frequently selected barriers to creating an ideal seed mix, confirming what we have heard from stakeholders. This may make it difficult for organizations to set seed sourcing guidelines, particularly for diverse seed mixes for which seed availability is even more limited. In the future, if seed

availability can be successfully increased, additional guidance to promote the use of locally adapted seed in restoration throughout the state may be beneficial.

Efforts to increase the availability of native seed in Wyoming will translate into better seed mix design only if land managers are willing to use species they have no or limited experience with. This is particularly important because most respondents indicated that seeding success from previous projects guides decisions about future seed mixes. There may be past failures due to a poor match between seed origin and project site, which may lead to erroneous conclusions about the general success of the species. This could result in excluding species that may be a valuable component of the native plant community. Additionally, over a third of survey respondents indicated that lack of expertise and capacity to spend time designing seed mixes were a major barrier to developing ideal seed mixes. This implies that we need to build an accessible

¹ Baughman, O.W., Agneray, A.C., Forister, M.L., Kilkenny, F.F., Espeland, E.K., Fiegner, R., Horning, M.E., Johnson, R.C., Kaye, T.N., Ott, J., St.Clair, J.B., Leger, E.A. 2019. Strong patterns of intraspecific variation and local adaptation in Great Basin plants revealed through a review of 75 years of experiments. *Ecology and Evolution*. 9, 6259-6275.

² Bower, A.D., St. Clair, J.B., Erickson, V. 2013. Generalized provisional seed zones for native plants. *Ecological Applications*. 23, 515-522.



evidence base for the use of diverse, genetically appropriate seed mixes in restoration across sites and years. Expanding access to training to increase comfort with seed mix design among practitioners may also be needed.

In addition to the more immediate changes that could be made to improve seed availability, there are additional factors that may need to be considered in the longer-term. For example, the most important consideration most seed users have when building their current restoration seed mixes is the make-up of the existing remnant plant communities. This is often done by completing surveys in adjacent intact habitats or by using Ecological Site Descriptions that have been compiled by NRCS. On the other hand, building resiliency to predicted future climate conditions ranked as one of the lowest considerations but may prove to be important in the future as our temperature and precipitation regimes change³. Species or seed sources that have performed well in past restoration projects may struggle under these regime changes and seed users need to be prepared to make adjustments. Another consequence of altered temperature and precipitation is the increasing likelihood of annual grass invasion. Avoiding or limiting the invasion of annual grasses ranked second among respondents as

a consideration when preparing seed mixes. However, if seed users are not considering how annual grass invasion is predicted to increase in large parts of Wyoming under future climate conditions, they may not be prepared to alter their seeding strategies to prioritize this goal. There are resources available for purchasing seed with future climate conditions in mind including the **Climate Smart Restoration Tool** (<http://climaterestorationtool.org/csrt/>).

Overall, there are tangible steps that restoration practitioners and seed producers could take to improve the native seed market in Wyoming. There are examples at the national, state, and local levels of groups coming together to begin addressing this problem including the **National Seed Strategy** (<https://www.blm.gov/programs/natural-resources/native-plant-communities/national-seed-strategy>), **Nevada Native Seed Partnership** (<https://www.partnersinthesage.com/nevada-native-seed-partnership>), **Willamette Valley Native Plant Partnership** (<https://appliedeco.org/restoration/native-seed-partnership/willamette-valley-native-plant-partnership/>) and many more. A similar partnership in Wyoming could go a long way toward collaboration between the disparate groups that make up the Wyoming native seed market.

³ Boyd, C.S. 2022. Managing for resilient sagebrush plant communities in the modern era: We're not in 1850 anymore. *Rangelands*, 44(3), 167-172.